Applicant Information

Name: Mike Arendt

Title: Wildlife Biologist III

Affiliation: SCDNR Marine Resources Division

Address: 217 Fort Johnson Road

City,State,Zip: Charleston, SC 29412

Phone Number: (843)953-9097

Fax Number: (843)953-9820

Email: ArendtM@dnr.sc.gov

Project Information

File Number: 19621

Application Status: **Application Complete - Issued**

Project Title: Distribution, relative abundance, demographic structure, and health of foraging sea turtles in the Southeast USA

Project Status: New

Previous Federal or State Permit: 15566

Permit Requested:
- ESA Section 10(a)(1)(A) permit (other)

Where will activities occur? US Locations including offshore waters

Research Timeframe: **Start:** 06/16/2016 **End:** 06/15/2021

Sampling Season/Project Duration: May through August in 2016, February through August in 2017, February through October in 2018 and 2019, and April through October in 2020.

Abstract: Since 2000, the National Marine Fisheries Service has funded and permitted a coastal trawl survey (conducted by the South Carolina Department of Natural Resources in partnership with the University of Georgia Marine Extension Service) to assess the distribution, relative abundance, demographic structure, and health of sea turtles in the Southeast USA. This novel research has been conducted annually and supported by three previous Section 10(A)(1)(a) permits (1245, 1540, 15566). Sampling focus during the past 16 years predominantly involved trawling at random locations in coastal waters between Winyah Bay, SC and St. Augustine, FL, but also included spatially-focused trawling in the shipping channels associated with Charleston, SC and Port Canaveral, FL. At this time we are requesting a new Section 10(A)(1)(a) permit to continue these research activities between 2016 and 2020 using the same basic capture methods and sea turtle processing procedures. Five additional aspects of data collection not previously requested are also included in this permit application: (1) a request to be able to conduct laparoscopy with a limited number (20 annually) of Kemp's ridley sea turtles in 2016 and 2017 to validate testosterone radioimmunoassay thresholds for assigning sex (study 2); (2) a request to attach acoustic and satellite telemetry devices to Kemp's ridley sea turtles (study 2); (3) a request to conduct sampling in estuarine waters using trawling where depth and habitats are appropriate for this gear (study 2); (4) a request to conduct sampling in estuarine waters using tangle nets where depth and habitats are not appropriate for trawling (studies 2 and 5); and (5) an expansion of the sampling season from May through August to February through October to accommodate additional sampling in the Port Canaveral, FL shipping channel (study 3) and in estuarine waters in South Carolina (study 5).

Project Description

Purpose: The overarching objective of our appropriated funding from the National Marine Fisheries, Southeast Regional Office is to conduct sampling over a broad spatial scale in a scientifically-sound manner to provide critical management data for sea turtles on foraging grounds. In 1999 a panel of experts determined that trawling was the most appropriate gear for sampling sea turtles in coastal waters across several degrees of latitude to assess relative abundance and enable capture of individuals to permit demographic and health assessments. The primary objective of this research is to assess changes in species composition and species-specific catch rates to assess relative abundance. The second objective of this research is to document species distribution patterns in order to assess probability of occurrence within the temporal and spatial confines of sampling; these data are collected through conventional and telemetry (acoustic and satellite) tagging. The third objective of this research is to assess changes in demographic structure within species, which is assessed using morphometric measurements as well as blood samples to measure testosterone (for assigning sex) and to determine genetic haplotype. The fourth objective of this research is to characterize and monitor turtle health; this aspect of data collection is enhanced by numerous collaborations with researchers predominantly located in the southeast U.S. To date, the collaborations have focused on foraging patterns using stable isotopes, general nutrition using a suite of standard clinical metrics, and exposure to contaminants.

In the past 16 years, more than 30 peer-reviewed publications have resulted from this research program supported by three previous Section 10(A)(1)(a) permits (#1245, #1540, #15566). Ninety percent of sea turtles captured in this coastal trawl survey were loggerhead sea turtles associated with the NW Atlantic DPS, with most originating from high-density nesting beaches in Florida (Note: A juvenile loggerhead sea turtle captured in this survey in 2000 nested at the Archie Carr National Wildlife Refuge in 2013). Ten percent of sea turtles captured in this survey to date were Kemp's ridley sea turtles, with two-thirds of captures occurring since 2010, consistent with increased nesting near the US-Mexico border (where 98% of nesting occurs for this species) during the ensuing decade.

Because sea turtles grow slowly and take decades to reach sexual maturity, require high annual survival rates to maintain viable populations, and generally only return to terrestrial habitats to nest as adult females or if something is wrong, long-term monitoring of key population metrics for sea turtles on foraging grounds is necessary for effective management. Distribution data collected for loggerhead sea turtles to date suggests that this coastal trawl survey is appropriate for monitoring temporal changes in relative abundance, demographic structure, and health

parameters for this species in the southeast USA (Arendt et al. 2012a,b). However, low overall captures of Kemp's ridley sea turtles, general capture occurrence for this species on the landward boundary of our trawl survey area, and no recaptures to date (despite tagging nearly 250 individuals) suggests that this species may disproportionately occur in habitats not historically sampled by our trawl survey. Given that Kemp's ridley sea turtle catch rates rapidly increased between 2010 and 2012, but then abruptly declined during the next two years, better understanding of the distributional patterns of this species in coastal waters of the southeast USA is needed to ensure proper interpretation of catch rate trends in our multi-decadal data set. Similarly, on average only one green sea turtle was captured annually, which we also suspect reflects a greater occurrence in waters shallower than our trawl survey operates, and also contributes to our interest in expanding the spatial extent of annual sampling to provide a more holistic assessment of trends for multiple sea turtle species in the southeast USA.

Between 2016 and 2020, we propose to sample sea turtles in five distinct spatial settings to address specific research questions presented below; methods describing capture and handling of sea turtles are provided in the project description section of this application. Sample sizes for capture and standardized data collection for each of these five sub-studies are equal to or less than historically authorized take limits, reflected anticipated catch rates based on historical sampling of three sea turtle species (loggerhead, Kemp's ridley, and green), and also takes into account the maximum amount of sampling or animals outfitted with telemetry devices that can be expended within our budget as detailed in the five respective study location descriptions below. This latter consideration is the primary reason that statistical power has not been assessed; as noted by Zar (1996), the only way to improve statistical power is to increase sample size, so if that is not an option then statistical power can also not be improved.

As noted on our program website, considerable effort was devoted to shaping the original sampling design of this trawl survey and similar efforts have been expended over the years to ensure the integrity of the design when the annual number of stations (330 to 419 annually under permit #15566) or the spatial focus has been modified (http://dnr.sc.gov/marine/sturtles/evaluations.html). The funding commitment of the National Marine Fisheries Service to this survey annually for 16 years, the number of peer-reviewed publications which have resulted from this data set, and incorporation of those publications into management documents such as the Critical Habitat Plan for NW Atlantic Loggerheads speak highly of the quality of data that is collected by the methods herein proposed.

(1) Charleston, SC shipping channel
Trawling at this location was previously conducted during 2004-2007, which revealed an increase in overall catch rates for loggerhead sea turtles relative to 1990-1991 as well as a shift towards smaller individuals than in the 1990s (Van Dolah and Maier 1993, Dickerson et al. 1995, Arendt et al. 2012c). Given a 10-year hiatus in sampling at this location which we previously proposed as a long-term monitoring site (Arendt et al. 2012c) and proposed efforts to dredge and widen this shipping channel to accommodate the largest cargo ships transiting the Panama Canal after 2016, there is an urgent need to collect more contemporary baseline data for loggerhead sea turtles (99% of captures during 2004-2007) at this location.

Historical data collected in this shipping channel document greatest seasonal occurrence of loggerhead sea turtles in May and June; thus, trawling would occur during these months in 2016 and 2017. We anticipate completing 160 annual trawling events at this location. During 2004-2007 we captured 220 loggerhead sea turtles in 432 trawling events (Arendt et al. 2012c), which is 0.51 loggerheads per event; thus, we increased this rate of potential capture to 0.7 loggerheads per trawling event to account for possible increases in catch rates in the past 10 years. Based on sampling at this location conducted by Van Dolah and Maier (1993), Dickerson et al. (1995), and Arendt et al. (2012c) we anticipate a low probability of capturing species other than loggerheads; thus, we requested annual take of one to five individuals per each of the other three species that could potentially be encountered.

In addition to assessing change in catch (and recapture) rates since 2004-2007, population size will also be estimated based on the ratio of acoustically-tagged loggerheads detected but not recaptured during sampling periods relative to the number of new non-tagged animals captured. Acoustic receivers deployed on trawl nets and on shipping channel navigational buoys in support of NMFS grant NA13NMF4720045 will be the primary source of data collection for this effort. In addition to our fishery-independent efforts to capture and process sea turtles in this channel, we have also been approached by the U.S. Army Corps of Engineers (Dena Dickerson) to collaborate with biologists conducting pre-dredge trawl relocation efforts, notably through the attachment of transmitters to a subset of sea turtles captured during pre-dredge trawl relocation efforts. As such, we have requested the ability to outfit 40 loggerhead sea turtles annually with acoustic transmitters in 2016 and 2017 which corresponds to five loggerheads per each of four research cruises in May and June plus up to 20 loggerheads for studies in conjunction the USACOE.

Because of extensive estuarine and coastal acoustic receiver coverage near Charleston, SC as a result of SCDNR research activities, we have also requested permission to be able to attach acoustic transmitters to all Kemp's ridley and green sea turtles that may be captured in the Charleston, SC shipping channel in 2016 and 2017. Although these sample sizes are small, we have no

recaptures of 267 Kemp's ridley or of 17 green sea turtles captured in our various in-water sampling activities to date; thus, any distribution data (particularly as it relates to residence in our sampling areas) is beneficial. Should acoustically- tagged sea turtles travel to areas outside of our sampling purview, we are confident that they would be reported as such because of grassroots researcher networks (ACT, FACT) along the U.S. East Coast; to date, we have received data on one loggerhead sea turtle that we tagged off Brunswick, GA that emigrated to the Gray's Reef National Marine Sanctuary, and we have also provided detection data to researchers in Virginia and New York after sea turtles that they tagged with acoustic transmitters were documented by the coastal array established under grant NA13NMF4720045.

(2) Coastal and estuarine waters near Brunswick, GA
A logarithmic relationship exists between sea turtle species and their relative capture rates in our various trawl surveys since 2000. Loggerhead sea turtles are the most commonly captured species and represent 90% of captures; Kemp's ridley sea turtles are the second most common species captured but only represent 10% of all sea turtle captures; and green sea turtles are the third most frequently seen sea turtle species but represent just 0.1% of captures. Because the intent of this line item Congressional funding through NMFS was to collect data on all sea turtle species in our survey region, complementary data sets are needed to improve relative abundance, demographic structure, and health assessments for sea turtle species other than loggerhead sea turtles in our research program. As such, we have proposed a two-year shift in sampling design to better understand the distributional patterns of Kemp's ridley and green sea turtles during 2016-2017.

The primary goal of this modified sampling is to assess the probability of occurrence (and influence of environmental correlates) of Kemp's ridley sea turtles in three spatial zones: estuarine waters; coastal waters shallower than where our trawlers can operate; and within the boundaries of our coastal survey. Distribution data will be used to determine if correction factors can be developed to account for the probability of species occurrence in our coastal trawl survey area, or if full-scale surveys in estuarine and shallow coastal waters are necessary to monitor population trends for Kemp's ridley and green sea turtles in this region. Provided that the latter conclusion is reached, the secondary goal of the proposed shift in sampling design in 2016 and 2017 is to determine if complementary sampling would be more efficiently conducted with short trawl tows or tangle net sets. In addition to low overall occurrence of Kemp's ridley sea turtles in the survey, an additional impetus for this shift in sampling design was a steady increase in catch rates for Kemp's ridley sea turtles between 2010 and 2012 followed by a steady decline in catch rates for this species in subsequent years (Schwenter et al. 2015).

Spatial concentration of catch for this species along the inner-most boundary of our multi-state trawl survey, correlation of annual catch with potential prey and commensal species, and stability in isotopic signatures collectively suggest that low capture and recapture rates for Kemp's ridley sea turtles may stem from a higher degree of mobility and reduced site fidelity compared to loggerhead sea turtles captured in our survey1. However, the most extensive information on seasonal movement patterns of Kemp's ridley sea turtles within the SAB remains the work of Henwood and Ogren (1987) which documented seasonal movement between Cape Canaveral and shrimp trawling grounds off South Carolina and Georgia. Overall recapture rate for Kemp's ridley sea turtles reported by Henwood and Ogren (1987) ranged from 5% (2 of 40 captured in NMFS surveys) to 14% (3 of 21 captured by shrimpers off South Carolina). In contrast, none of 267 Kemp's ridley sea turtles captured in our various in-water trawl surveys to date has ever been recaptured during our survey or reported as recaptured in other in-water surveys, and only one has ever been reported as stranded (six years at large, moved between Jekyll Island, GA and Cape Canaveral, FL). Tag-recapture and telemetry observations document that Kemp's ridley sea turtles leave foraging grounds in Virginia (Henwood and Ogren 1987) and New York (Morreale 1999) to overwinter between Cape Hatteras, NC and Cape Canaveral, FL; however, this movement may not occur annually as evidenced by our capture of a tagged Kemp's ridley off Ponta Vedra, FL in August 2014 that stranded in New York in December 2012.

Summer coastal movement data for Kemp's ridley sea turtles in the SAB outside of migratory windows is limited to two satellite telemetry tracks. Renaud (1995) attached a satellite transmitter to a juvenile Kemp's ridley sea turtle in November 1989 and tracked this individual for the next seven months; after overwintering as far south as Melbourne Beach, FL, this Kemp's ridley resumed a coastal migration to central South Carolina waters, but was most localized off Charleston, SC where it occurred in both estuarine and near-shore coastal waters between mid-April and early June. Gitschlag (1996) attached a satellite transmitter to an adult-sized female in October 1991 that was highly mobile off South Carolina, Georgia, and north Florida between fall and spring, but then settled into a more residential pattern off South Carolina during late spring and early summer; during the residential period, this Kemp's ridley sea turtle occurred in both estuarine and coastal waters near Port Royal Sound, SC.

We propose to improve the state of knowledge of within-season movement patterns of Kemp's ridley sea turtles by attaching acoustic and satellite transmitters to a sub-set of individuals captured in coastal and estuarine waters near Brunswick, GA in June and July 2016 and 2017. Funding has been approved (NMFS Grant NA13NMF4720182) to outfit six Kemps' ridley sea turtles with satellite transmitters and 16 Kemp's ridley sea turtles with acoustic transmitters in 2016, which we intend to split evenly between coastal and estuarine capture locations pending federal and state

approval of our proposed methods. This study area was selected because it corresponds with the epi-center of Kemp's ridley captures in our coastal sampling since 2000 and because it is close to the homeport of the RV Georgia Bulldog which is efficient for sampling. Similar to study location one, an acoustic telemetry receiver array exists in study location two a result of NMFS Grant NA13NMF4720045, and this array will remain operational as well as increased in spatial scope through at least the proposed 2017 sampling season.

Because we have not conducted extensive targeted sampling in this proposed area, our requested take was based primarily on anticipated sampling effort and historically authorized take. Specifically, we have received funding to support eight trawling days in coastal waters, four trawling days in estuarine waters, and four tangle net sampling days in estuarine waters in 2016. However, depending on logistical considerations we may elect to conduct all 16 field days in the coastal ocean; thus, the take table for trawling was set up with this maximum trawling aspect scenario in mind. Assuming eight trawl tows per day we can expect to complete 128 trawling events annually. Assuming Kemp's ridley sea turtle catch rates comparable to catch rates reported for loggerhead sea turtles in the Charleston, SC shipping channel during 2004-2007 (Arendt et al. 2012c), we can expect to capture 64 Kemp's ridley sea turtles by trawling annually. Similarly, if we conduct four hours of tangle net sampling on each of four proposed sampling days, our requested annual take of 24 Kemp's ridley sea turtles by tangle netting is slightly greater than anticipated for trawl capture events. Total requested annual take of 88 Kemp's ridley sea turtles across sampling gears for study location two is 10% greater than annual take (79) for this species authorized under Permit #15566 (expires 30 April 2016).

Requested annual take of 60 loggerhead sea turtles was based on the assumption that this species will be captured 25% less often than Kemp's ridley sea turtles during trawling operations and half as often during estuarine tangle net sampling. Requested annual take of 40 green sea turtles was based on the assumption that this species will be rare in coastal trawling, equally common as Kemp's ridley sea turtles in estuarine trawling, and twice as common as Kemp's ridley sea turtles captured during estuarine tangle net operations. We anticipate a low probability of capturing a leatherback sea turtle during job two, but have requested an annual take of one per gear type for Job 2 as a precautionary measure.

We also propose to transport up to 20 Kemp's ridley sea turtles (ideally captured in the estuary to limit transit time) to the Georgia Sea Turtle Center where laparoscopy will be conducted by Dr. Terry Norton to characterize gonadal tissue as either testes or ovary to validate testosterone radio-immunoassay thresholds for assessing sex for this species; these data will augment research being conducted by the NMFS Southeast Fisheries Science Center in Beaufort, NC (J. Braun-McNeill, Principal Investigator).

(3) Port Canaveral, FL shipping channel
Because sea turtle sex is determined by incubation change, a feared consequence of increased coastal air, water, and soil temperatures is that sea turtle populations will become male-limited in the future, either as a result of inadequate numbers of males for fertilization or due to reduced genetic diversity given evidence of multiple paternity across sea turtle species. In 2014, the shipping channel and adjacent coastal waters near Port Canaveral, FL were designated as one of two "critical breeding habitats" for loggerhead sea turtles in the NW Atlantic Ocean (NOAA 2014). As such, efforts to monitor changes in population size and structure at this location should be considered a high priority for recovery; thus, we intend to submit a multi-state research proposal for Federal Funding Opportunity (NOAA-NMFS-PRPO-2016- 2004539) to evaluate relationships between the relative abundance of males throughout the breeding season and the distribution of nesting effort between 2017 and 2019.

We previously conducted trawl sampling for sea turtles at this location under Section 10(A)(1)(a) permit #1540, during which time a modest number (41) of adult male loggerhead sea turtles were captured for studies focused on techniques for assessing and ultimately evaluation of reproductive condition (Blanvillain et al. 2008, Pease et al. 2010) as well as temporal-spatial distribution patterns (Arendt et al. 2012d,e). However, limited sampling in 2006 and 2007 precluded reliable comparison of catch rates with extensive trawl surveys conducted using the same gear in the mid-1990s (Dickerson et al. 1995) and by shrimp boat observers in the late 1970's and early 1980s (Henwood 1987). Thus, in contrast to our previous sampling in 2006 and 2007, we propose to complete 160 or more trawling events annually between 2017 and 2019 during 5-day research cruises in February, March, April, and May. Henwood (1987) reported that males arrived en masse at this shipping channel as early as February and Arendt et al. (2012e) demonstrated rapid dispersal of telemetered males by mid-May; thus, the proposed sampling timeframe encompasses the majority of the historical mating season.

Requested annual take of 125 adult male loggerhead sea turtles equates to 0.78 males per trawling event, a 10% increase relative to our capture rates for adult male loggerheads in 2006–07. During our previous trawling work at this location catch rates were 2.6 juveniles/sub-adults and 0.2 adult females per trawling event; thus, increasing each of these rates by 10% and extrapolating for 160 trawling events, we anticipate capturing 455 juveniles/sub-adults and 35 adult females annually during 2017–19. Because of the anticipated number of sea turtles captured

and processed each day, only the first 10 adult male loggerheads captured in each cruise will receive acoustic transmitters; subsequent detection (by acoustic receivers deployed on the trawl net and on shipping channel buoys) for these 40 males will be used to generate a "detectabilty" (Anderson 2001) metric for each trawling event that will be then incorporated into our catch rate analysis model (Arendt et al. 2012f).

No other sea turtle species were captured during trawling in the Port Canaveral, FL shipping channel in April 2006 and 2007; however, because we are proposing a four-fold increase in trawling effort at this location as well as expanding the temporal window for sampling, we have requested an annual take of 15 Kemp's ridley sea turtles which over-winter at this location (Henwood and Ogren 1987), five green sea turtles which can stray into our trawl area from the adjacent Trident Tidal Basin (Ehrhart et al. 2007), and one leatherback sea turtle as a precautionary measure.

In addition to collecting contemporary data for comparison with historical data as appropriate, an over-arching goal of this new research will also be to train numerous regional researchers in trawl sampling and at-sea processing techniques to increase the ability of Florida researchers to take the lead on future trawl sampling at this important long-term index site. Genetic data, morphometric data, and foraging ground assignment data for adult male loggerhead sea turtles will also be made available to researchers investigating paternity on nesting beaches, which has the potential to greatly increase understanding of breeding periodicity for males, long-term survival of adult males, and the geographic extent of nesting associated with this critical breeding ground for loggerhead sea turtles in the NW Atlantic DPS.

(4) Coastal waters adjacent to Winyah Bay, SC (33.1°N) to St. Augustine, FL (29.9°N)
In 2018, we plan to resume randomized trawling (May through July, August as needed) in coastal waters between Winyah Bay, SC and St. Augustine, FL, the foundation on which in this in-water sampling program was built. Anticipated reductions in annual funding for this regional survey coupled with interest in conducting estuarine sampling and subsequent telemetry monitoring of distribution within estuarine and shallow coastal waters will likely reduce annual sampling to 20 sea days per each of two research trawlers; for comparison, 24 sea days per trawler were typically completed annually during 2011–2015. As such, we have requested annual take for this study location accordingly.

Annual take for loggerhead sea turtles between 2011 and 2015 averaged 0.31 (range = 0.28 to 0.36) per trawling event; thus, assuming the completion of 360 trawling events annually and allowing for a 20% increase above the peak annual catch rate during the previous permit we anticipate that an annual loggerhead capture rate of 160 will be sufficient to test hypotheses regarding temporal change in catch rates, demographic structure, and health. Although overall catch rates for loggerhead sea turtles have remained relatively stable since this survey began in 2000, increased catch rates were reported through 2011 (Arendt et al. 2012f) and remained elevated through 2015 (Arendt, pers. obs.) for loggerhead sea turtles measuring 75.1 to 80.0 cm SCLmin, consistent with increased nesting of this species at Florida index beaches after 2007 that were predicted to be driven by neophyte nesters during the initial rebuilding phase of this population (Arendt et al. 2013). Changes in the relative frequency of other size classes have not been observed in this survey, but should continue to be monitored through at least the end of the decade given a 41% decline in loggerhead nesting on Florida index beaches between 1998 and 2007 (Witherington et al. 2009) and recruitment back to neritic habitats at approximately age 12 and 56 cm SCLmin (Avens et al. 2013), which we predict should result in reduced recruitment of younger (and presumably smaller) loggerhead sea turtle to neritic habitats between 2010 and 2019.

Annual take for Kemp's ridley sea turtles between 2011 and 2015 averaged 0.08 (range = 0.05 to 0.11) per trawling event; thus, assuming the completion of 360 trawling events annually and allowing for a 20% increase above the peak annual catch rate during the previous permit we anticipate an annual Kemp's ridley capture rate of 45 and have requested this annual take, accordingly. Although this sample size is considerably smaller than the annual capture of loggerhead sea turtles in the same survey, it does not preclude viable statistical analysis of temporal variability of overall catch rate for this species, which has been presented at several scientific symposia since 2012 and for which a peer-reviewed publication is currently in preparation. We further anticipate that data collected for Kemp's ridley sea turtles in this coastal trawl survey will be greatly enhanced by the proposed data collection regarding influences on local distribution patterns in 2016 and 2017 in study location two. As such, we request permission to annually outfit up to 10 of these Kemp's ridley sea turtles with acoustic transmitters to continue efforts to document local movement patterns for this species which are poorly understood in this region.

Annual take for green sea turtles in this regional survey has never exceeded two per year and annual take for leatherback sea turtles in this regional survey has never exceeded one per year; thus, we respectfully request permission to capture and process up to three green sea turtles and one leatherback sea turtle annually. In addition to standard processing, we also request the ability to outfit all green sea turtles with appropriately-sized acoustic transmitters to continue efforts to document coastal and estuarine movement patterns for this species which are poorly understood in this region. In 2015 we encountered our first previously-tagged green sea turtle; this green sea turtle was tagged as a juvenile in Florida Bay and recaptured 20 years later as an adult. As such, it

is a worthwhile endeavor to opportunistically attach acoustic transmitters to green sea turtles, especially given the extent of inshore acoustic receiver networks in potential foraging habitats for this species along the U.S. East Coast.

(5) Estuarine and near-shore coastal sampling in South Carolina waters:
Concurrent with resuming the coastal trawl survey off SC, GA, and north FL in 2018, we also propose to initiate telemetry studies with green, Kemp's ridley, and loggerhead sea turtles captured in estuarine or near-shore coastal waters not sampled by the coastal trawl survey. Emphasis between 2018 and 2020 will be on outfitting sea turtles captured in these waters with satellite and acoustic transmitters in order to better characterize temporal-spatial distribution patterns to determine the need for (and delineate the boundaries of) a companion inshore/estuarine sampling program in the future. Hopkins-Murphy et al. (2003) suggested that loggerhead sea turtles likely forage in large, high salinity estuaries in South Carolina such as Port Royal Sound and St. Helena Sound; however, to date quantitative data on the occurrence of loggerhead sea turtles in these estuaries is limited to a few individuals captured in shipping channels that were later opportunistically tracked in the estuary (Arendt et al. 2012a,e). Provided that a companion survey is deemed necessary, standardized sampling protocols to monitor temporal variability in species composition, relative abundance, demographic structure, and health of sea turtles will be developed for implementation in the next permitting cycle.

Because we have never conducted sampling in these estuaries with tangle nets or other sampling gears, requested annual take was primarily based on anticipated sampling effort. We anticipate conducting four tangle net sets per month (most likely twice per week, every other week) between April and October. As such, requested annual take was estimated as an average capture rate of one loggerhead per tangle net set and two per tangle set each for green and Kemp's ridley sea turtles. Because there is a low probability of capturing a leatherback sea turtle during tangle net operations, except possibly in Port Royal Sound where they have been reported to occur during the summer (B. Frazier, SCDNR, pers. comm.), we requested an annual take of one as a precautionary measure. Given that the primary emphasis of tangle net sampling in SC estuaries during 2018 to 2020 will be to capture sea turtles for the purpose of gathering occurrence and movement data, we requested to attach up to 10 transmitters to each of these species annually.

Description: This section of the application describes capture methods for trawl and tangle net gears and subsequent animal handling procedures. Animal processing methods described include (a) general processing and handling, (b) non-sea turtle catch, (c) physical examination of sea turtles, (d) sea turtle morphometric measurements, (e) sea turtle tagging to include conventional and telemetry tags, (f) blood collection, (g) ultrasound, (h) laparoscopy, and (i) tissue sample collection.

1. Capture Methods.
a. Trawling
Our trawl gear consists of two wooden doors (8' x 40') that plane away from each other as the vessel makes headway, which spreads out a modified shrimp net attached to the posterior of the inside and outside doors. One set of doors and one trawl net are deployed on each of the port and starboard sides of the trawler/research vessels. Trawl net modifications include the absence of a Turtle Excluder Device (TED) and large-mesh webbing to minimize fisheries by-catch.

The primary trawl net used in this research since 2000 (Arendt et al. 2012c,e) is the NMFS Turtle Net which is also routinely used to capture sea turtles in shipping channels (Dickerson et al. 1995). NMFS Turtle Nets are flat nets with a 4-seam, 4-legged, 2-bridal design. Trawl perimeter around the mouth is 137 ft. (60 ft. head rope + 65 ft. foot rope + 2 x 6 ft. wing end height). Net body and cod end consist of 4" bar (8" stretched) and 2" bar (4" stretched) mesh, respectively. Net tops and sides are made of twisted nylon (#36) and the net bottom consists of braided nylon twine (#84); nets dipped in a creosote coating for integrity. Nets are brought on-board using winches and turtles are removed from nets and immediately checked for health status and existing tags.

During randomized sampling in coastal waters, tow time is restricted to 42 minutes between the doors entering the water and returning to the water surface, with a target bottom tow time of 30 minutes. This tow time was initially authorized during 2000–2003 (Permit #1245) and re-authorized during 2011–2015 (Permit #15566). To date, we have conducted a total of 4,598 trawling events with this tow time which resulted in the capture of 1,639 sea turtles, of which only five (all prior to 2003) required intubation to resume normal activity levels. Because of our short tow times and training to respond quickly in emergency situations, our intubation and mortality rates since 2000 are substantially lower than the 11% comatose and mortality rate reported for Southeastern shrimp fishery during 1973-1984 (Sasso and Epperly 2006), for which mortality only exceeded 1% after 50 minutes of towing. Our requested tow time is also more conservative than National Research Council (1990) recommendations. Satellite telemetry data collected for a subset of our loggerhead sea turtles document survival following capture by trawling and subsequent handling (Arendt et al. 2012a,d,e).

As detailed in our application for permit #15566, it is necessary to preserve a 30-minute on the bottom tow time for our regional survey which is conducted by random sampling in coastal waters between Winyah Bay, SC (33.1°N) and St. Augustine, FL (29.9°N). However, we anticipate reducing the tow time to less than 20-minutes (bottom time) during sampling in the Charleston, SC and Port Canaveral, FL shipping channels to enable comparison of catch rates in the same spatial blocks previously sampled by former research studies (Van Dolah and Maier 1993, Dickerson et al. 1995, Arendt et al. 2012c,d). Similarly, we anticipate a target bottom tow time of 15-minutes during estuarine sampling in St. Simon's Sound, GA and in South Carolina estuaries, consistent with research trawling protocols in estuarine habitats in Georgia (http://coastalgadnr.org/fb/fmgmt/trawl). Trawling is also used to monitor shrimp and crabs in open estuarine waters in South Carolina, but with an even smaller net (20 ft.) than used in Georgia estuaries (http://www.dnr.sc.gov/marine/mrri/shellfish/bcrabshrimpsum.html).

Trawling will be primarily completed by two research trawlers, but estuarine trawling in South Carolina may be contracted out to local shrimp boat operators that are intimately familiar with local waterways; however, in all cases, trawling would use the NMFS Turtle Net previously described. Trawling in coastal South Carolina waters will be completed by RV Lady Lisa, a 75 ft. St. Augustine-built wooden trawler owned and operated by the SCDNR and based in Charleston, SC. Sampling in coastal waters off Georgia and Florida will be completed by the RV Georgia Bulldog, a 72 ft. St. Augustine-built wooden trawler based in Brunswick, GA and owned and operated by the University of Georgia Marine Extension Service.
All trawling will be conducted during daylight hours, commencing approximately an hour after sunrise and ceasing approximately an hour before sunset. In all sampling areas, a goal of eight or more trawling events per day is proposed based on prior experience; sea turtle catch rates in shipping channels tend to be higher and require longer processing time, whereas shorter sea turtle processing times in random coastal waters are offset by longer transit times between stations. Based on daily trawling goals and budgeted sea days of effort, we anticipate annually completing 50+ trawling events in St. Simon's Sound, GA; 100+ trawling events for the Port Canaveral, FL shipping channel; 150+ trawling events in the Charleston, SC shipping channel and concentrated sampling in coastal waters off Brunswick, GA; and 300+ trawling events in the full coastal survey between Winyah Bay, SC and St. Augustine, FL.

Funding for the proposed in-water sea turtle research is predominantly provided as a line item ("Southeastern Sea Turtle (SC)") in the NMFS budget that is authorized annually by appropriation. The SCDNR manages this grant awarded under the Unallied Science Program of the Catalog of Federal Domestic Assistance, authorized by the Fish and Wildlife Coordination Act (16 U.S.C. 661). Funding is authorized for 1 September 2015 to 31 August 2016 and we anticipate funding thereafter; thus, we request permit coverage for 2016-2020. In addition, we are actively pursuing competitive funding opportunities through the National Marine Fisheries Service (i.e., Grants to States Recovery Program) as well as non-competitive funding opportunities through the U.S. Army Corps of Engineers to support the proposed research activities.

b. Tangle net
[Note: This section on tangle net methodology was written with assistance from Dr. Katharine Mansfield (University of Central Florida), Dr. Eric Reyier (Kennedy Space Center), and Mr. Ryan Whelsh (In-Water Research Group), all of whom have offered to train the PI and project staff in safe operation of tangle net gear; we plan to receive this training in August 2015. The procedures outlined below conform to the "Standard Conditions for Tangle Netting" established by the NMFS Office of Protected Resources]

As stated in the Project Purpose of this application, we propose to use tangle netting to capture Kemp's ridley sea turtles in St. Simon's Sound, GA in June and July 2016 and 2017, as well as to conduct exploratory fishing operations in major estuaries in South Carolina in 2018, 2019, and 2020.
We anticipate conducting at least eight sampling days in St. Simon's Sound, GA in each year, as well as anticipate completing at least four sampling days per month in South Carolina estuaries between May and September in 2018, 2019, and 2020. For comparison, Ehrhart et al. (2007) averaged 2.4 net sets (with 455 m of net) per month over a 282 month period between 1982 and 2006; thus, our proposed efforts in St. Simon's Sound, GA will be at least equal to the effort expended by Ehrhart et al. (2007), but likely about half of the Ehrhart et al. (2007) level of effort during pilot study efforts in South Carolina.

We propose to use large mesh (40 cm stretched mesh) tangle nets of the same height (3.7 m), length (230 m), and webbing material (#18 nylon twine) as described by Ehrhart et al. (2007). Given staff limitations and tidal amplitudes of ?1.5 m, we initially plan to fish only one net vs. two nets simultaneously fished by Ehrhart et al. (2007); however, as the availability of experienced field crew increases, we intend to fish the same amount of webbing per set so as to facilitate comparisons with other data sets in the region. Also comparable to Ehrhart et al. (2007), the top line of this tangle net will consist of 0.635 cm (dia.) braided polypropylene, with surface floats attached every 10 m along the top line for buoyancy during net deployment. The bottom line will consist of No. 30 continuous core lead line, which allows the bottom of the net to sink to the seafloor while minimizing snagging associated with external weights.

Tangle nets will be set generally parallel to but offset from the shoreline to minimize variability in set depth along the length of the deployed net, and in areas with at least 2 m of water at low tide to ensure reliable access to service the net across all stages of the tide. While moving downwind and down current, a Danforth (8 kg) anchor with 1.5 m of chain (0.8 cm dia.) connected to the top line of the net by a 15 m (1 cm dia.) nylon line will be deployed from the bow of a 6.4 m research vessel. After confirming that the anchor is holding, the net will then be slowly paid out from the vessel while moving down-current and down-wind to ensure that the webbing is deployed away from the vessel propeller. During this deployment process, at least two field hands ensure that the bottom line is not twisted over the top line and attach surface floats at 10-m intervals between the end and the beginning of the net; the time between deploying the start and end of the net is also recorded. A second Danforth anchor with identical rigging configuration is attached to the terminal end of the net and deployed once the 15 m lanyard is taught to further secure the net position and prevent net drift.

One tangle net per vessel will be set only during daylight hours and fished between high and low tide (but not necessarily in that order), between April and October. Target soak time is three hours, during which time the researchers are in constant visual contact with the net. Hand over hand retrieval of the net will be used to ensure that the entire net (top line to bottom line) is inspected, given that small sea turtles, especially those that become entangled near the seafloor, may not always generate a distinct net strike signal (i.e.., net and floats moving). A minimum of one research vessel will be assigned to each net and will conduct hand over hand inspection in the same direction as the net was deployed; this strategy should ensure that any point on the net is checked at least once every 15 minutes.

Captured marine life will be brought on board and removed from the net; large-hoop dip nets will be available for boarding and subduing larger specimens such as stingrays, sharks, and sea turtles. When non-sea turtle species are encountered they will be removed from the nets and either released immediately or transferred to a second vessel (of similar dimensions/design as the primary net boat, approximately 6.4 m in length) to briefly record basic biological data before release. All captured sea turtles will also be transferred to this second vessel for processing as described in detail in Part 2 of this Project Description. Captured sea turtles will be placed in padded containers to keep them safely restrained until they can be processed, as well as during epoxy curing for the sub-set of sea turtles that receive telemetry transmitters, the attachment of which is also described in Part 2.

2. Animal handling procedures

A. General Processing: A sequential project identification number is assigned to each turtle, after which each turtle receives a qualitative physical exam, and blood and morphometric measurements are collected (described in detail below). Temporary marking of the carapace using a yellow crayon may be used to distinguish individual turtles following blood collection and prior to measurement and tagging for sampling events when two or more turtles of the same species are collected. All turtles will be tagged and photographed prior to being released, approximately 20 minutes after being removed from the nets and the onset of data collection. Turtles are released back into the ocean by lowering them over the side of the vessel while it is out of gear. Turtles are released as close to the capture location as possible (generally within 0.5 nm of the sampling transect), with emphasis on releasing turtles in areas where they will not be likely to be immediately recaptured by the research vessel or other trawlers operating in the general area. General capture and handling procedures for the trawl portion of this permit application are available online at: http://www.dnr.sc.gov/marine/sturtles/methods.html

B. Bycatch: A diversity of bycatch is expected, with composition highly-dependent on sampling location. Finfish and invertebrates are identified to species or other suitable taxonomic level and a count or estimate of abundance made. When finfish or invertebrate species of interest are collected, appropriate length (cm) measurements are recorded. Elasmobranchs (sharks and rays) are identified to species and appropriate length (cm) measurements recorded. To date, more than 300 bycatch species have been recorded in this sea turtle trawl survey. Most finfish belong to one of four Families (Sciaenidae – drum and trout; Carangidae – jacks; Bothidae – flounders; and Serranidae – sea basses) and most invertebrates are classified as Decapods (crabs, shrimp), Echinoderms (sea stars and sand dollars), Porifera (sponges), and Cnidarians (jellyfishes). Large mesh nets result in low levels of bycatch for any given trawling event, with an average of <65 organisms collected per net set. Bycatch survival rates are species-specific, but we estimate that our attempts to release bycatch alive are 90% successful. For example, elasmobranch by-catch are processed first; small fish are placed in water during extended holding for identification; and mobile inverts are repositioned in their shelters (sponges, tunicates, etc) before being returned to the sea. More information about the by-catch captured by trawling in this survey is available online at: http://www.dnr.sc.gov/marine/sturtles/bycatchproc.html

A subset of selected by-catch specimens may be sampled (non-lethal) or sacrificed for scientific purposes consistent with state permit stipulations. Previous non-lethal sampling of by-catch

includes the collection of blood samples for conducting health assessments with stingrays (Cain et al. 2004), bonnethead sharks (Harms et al. 2002), Atlantic sharpnose sharks (Karsten and Rice 2004, 2006; Haman et al. 2012), and blood collection from several crab species to test for the presence of a parasite, Hematodinium sp. (none found) in summer 2002. Sacrificial sampling has been infrequently utilized to collect voucher specimens for (or to have identified by) the Southeast Regional Taxonomic Center; for life history studies (blacknose sharks, cobia, smooth butterfly rays); and for evaluation of stable isotope concentrations in potential sea turtle prey items (whelks, swimming crabs, horseshoe crabs, sea stars, urchins, squid, jellyfishes). Annually, less than 20 specimens per species are generally sampled or sacrificed and sacrificed specimens frequently come from species that are not managed by any agency.

C. General Physical Examination: All sea turtles will be examined for general physical condition, with emphasis on (1) examining the shell, skin and flippers for trauma, epibiota, tumors, bites, missing or defective anatomical features, foreign bodies, sloughing of tissues, oil and tar; (2) examining the eyes, nares and oral cavity for discharge, sunkeness (sign of dehydration), corneal lesions, tumors or
foreign bodies; (3) responsiveness to light touch and overall coordination; (4) examination of muscle mass for signs of chronic disease or malnutrition (i.e., sunken plastron, baggy skin); and (5) observation of shallow (one breath/min) or rapid (>5 breaths/min) breathing and head-raising when breathing. Tumors and unusual growths will be biopsied and tissue stored in 95% ethanol for histology and sequencing at the College of Veterinary Medicine, University of Florida.

D. Morphometric Measurements and Photography: A suite of morphometric measurements are collected for all sea turtle species. Six straight-line measurements (cm) are determined using tree calipers: minimum (CLmin) and notch-tip (CLnt) carapace length; carapace width (CW); head width (HW); and body depth (BD). Curved measurements of CLmin, CLnt and CW are determined using a nylon tape measure. Additional curved measurements include plastron width (PW), and two tail length measurements (tip of plastron to tip of tail (PT) and tip of cloaca to tip of tail (CT)). All measurements represent standard measurements accepted by sea turtle researchers globally (Bolten, 1999). Measurements are generally made while turtle movements on deck are restricted (for ease and greater accuracy) by placing them atop of foam-filled go-kart tires. Body weight (kg) is measured using spring scales; turtles are placed in a nylon mesh harness and carefully raised off of the deck using a winch.

Prior to their release a digital photo is taken of each turtle in a standard 'pose' (dorsal surface exposed, looking from anterior to posterior) to include a marker board with the (1) turtle identification number and (2) trawl collection number. Additional images of unusual markings or injuries are also recorded.

E. Tagging:

a.) Conventional - All sea turtles receive a Passive Integrated Transponder (PIT) tag (125 kHz) and all sea turtles >5kg also receive two Inconel flipper tags. Triple tagging minimizes the probability that project-tagged turtles cannot be identified as such should they be re-sighted. PIT tags are read using a specialized scanner while flipper tags are externally discernible. PIT tags are sterile-packed whereas flipper tags must be cleaned to remove oil and residue prior to application. Tag insertion sites (between the first and second scales on the trailing edge of the front flippers for Inconel tags, right front shoulder for PIT tags) will be alternately wiped with betadine scrub and alcohol (repeated twice) prior to tag application. Per new guidelines, all sea turtles <30 cm SCLmin (0% of loggerheads and leatherbacks, 10% of Kemp's ridleys, and 59% of green sea turtles captured in our surveys to date) will receive a sub-cutaneous injection of lidocaine (<0.5 ml) at the site of the PIT tag injection site prior to receiving the PIT tag. The P.I. and C.I.'s are all very experienced with these conventional tagging procedures and have also occasionally administered lidocaine to sea turtles prior to removing stingray barbs will oversee all tagging operations. To date we have never captured a sea turtle <15 cm SCLmin; thus, we do not anticipate the need for additional veterinarian-approved tagging protocols.

b.) Acoustic transmitters – We initiated acoustic telemetry studies with loggerhead sea turtles captured by trawling in 2004 (Maier et al. 2005), but quickly abandoned manual tracking efforts in favor of satellite telemetry (Arendt et al. 2012a). However, with the deployment of acoustic receiver arrays near Charleston, SC and Brunswick, GA in 2014, we resumed efforts to incorporate acoustic telemetry into our data collection repertoire.

We propose to use the same methods for acoustic transmitter attachment to loggerhead sea turtles in 2014 and 2015 for attaching these devices to a subset of all hard-shelled sea turtles captured during 2016 to 2020, but will scale transmitter size to animal size. Acoustic transmitters will be opportunistically attached to sea turtles provided macroscopic physical exam and onboard bloodwork suggest that individuals are healthy and above a minimum size criteria. Opportunistic attachment is defined as the first individuals captured in a given study area; however, when it is

preferable to stagger transmitter deployments over the sampling season, only the first few individuals captured in a given research cruise will receive acoustic transmitters. It is worth noting that the attachment methods described below have also been used to attach V9 series transmitters to diamondback terrapins weighing 0.3 to 1.8 kg; thus, should not be problematic for sea turtles weighing >3 kg.

Acoustic transmitters will be purchased from Amirix/Vemco to ensure detection compatibility with receiver arrays where the sea turtles are captured as well as by researcher networks elsewhere in the southeast U.S. where tagged sea turtles may relocate after capture; for example, a loggerhead sea turtle tagged in Chesapeake Bay, MD (Sue Barco, Virginia Marine Science Musuem) and a Kemp's ridley sea turtle tagged in Long Island Sound, NY (Kim Durham, Riverhead Foundation) were detected by receivers off Charleston, SC and/or Brunswick, GA several months later. V16-series transmitters measuring 16 mm in diameter with a maximum length of 98 mm will be attached to sea turtles that weigh at least 5 kg given that the transmitter plus attachment epoxy should not weigh more than 100 g (2% of body mass). Smaller diameter and length (?48 mm) V13- or V9-series transmitters will be used for sea turtles weighing <5 kg. Transmission repetition rate will be selected as the shortest interval possible that permits one year of data collection, to enable assessment of return to capture areas following over-wintering which presumably occurs elsewhere.

Transmitters will be placed on a flat surface of the carapace near the center of the body to evenly distribute transmitter weight as much as possible. Loose keratin and biogenic fouling will be removed from the carapace to provide a clean epoxy attachment surface, and epoxy will also cover multiple scute seams to further increase the probability of transmitter attachment for one year. This carapace cleaning process includes gentle leverage and mild scraping with a chisel and scrubbing via plastic mesh pad. The cleared area will be rinsed, then dried prior to sanding the same area with sand paper (100 grit) to produce a smooth finish (i.e., devoid of shedding keratin) for the epoxy to adhere to. After sanding is completed, the preparation area will be treated with betadine, and then wiped clean with an alcohol (70% Isopropenol) to ensure a dry surface for the epoxy to contact.

The seam associated with the fourth and fifth vertebral scutes and the fourth costal scute of loggerhead sea turtles provides a good location for both distribution of transmitter package weight, submergence of the transmitter when sea turtles surface to breathe, elevating the transmitter above the seafloor for resting sea turtles, and reducing contact/snagging with trawl gear during future recapture events. After the carapace surface has been cleaned, a base layer of SonicWeld epoxy (Ed Greene and Company, Sparta, TN) is secured to the carapace, the transmitter is embedded in the epoxy with the transducer end of the transmitter extending <0.25 in. past the epoxy base, and additional epoxy is used to encase the transmitter in a protective shell that includes a tear drop shaped, hydro-dynamically efficient fairing in front of transmitter to reduce drag and limit the effects of the transmitter on the turtle's energetics (Watson and Granger 1998).

Data from transmitters will be collected in conjunction with this survey through the placement of a VR2W receiver near the mouth of the trawl net (and occasionally deployed 2 m below the keel of the trawler while anchored at night), but are predominantly collected independent of this trawl survey by receivers maintained by other research studies. Data collected from the transmitters include a unique identification number and sensor data (temperature, water depth) if those options are selected. Acoustic transmission of data occurs at a frequency of 69.0 kHz which should not affect sea turtles that hear at low (1 kHz) frequencies (Moein Bartol and Musick 2003). Sharks are also cued for low frequencies (Corwin 1989); thus, acoustic transmitters are not likely to increase predation risk by sharks. Dolphins perceive a wide range of auditory frequencies (Ridgway 1990) to include the signal transmission range of acoustic transmitters. However, because signal transmission will only occur approximately every 45-seconds and consist of a rapid burst of sound lasting approximately 2-3 seconds, negative behavioral effects on any species capable of hearing the transmission are unlikely.

Time lapse between removing the epibionts to completion of epoxy curing is approximately 30 minutes. The PI and CI's used this procedure used to attach acoustic transmitters to 14 loggerhead sea turtles in 2014 (15 more planned for 2015) and 37 diamondback terrapins since 2013 (20 more planned for 2015).
Between 2016 and 2018, we propose to attach acoustic transmitters on a maximum of 40 sea turtles annually; however, during 2019 and 2020 that number increases to 65 due to emphasis on spatial and temporal distribution patterns of multiple species of hard-shelled sea turtles in estuarine and near-shore coastal waters (see Take Table for breakdown of acoustic tagging by species and sampling area).

c.) Satellite Transmitters – Satellite transmitters will be opportunistically attached to sea turtles provided macroscopic physical exam and onboard bloodwork suggest that individuals are healthy and above a minimum size criteria. Opportunistic attachment is defined as the first individuals captured in a given study area; however, when it is preferable to stagger transmitter deployments over the sampling season, only the first few individuals captured in a given research cruise will receive transmitters.

Preparation of the carapace for attachment of satellite transmitters is identical to procedures for attaching acoustic transmitters; however, satellite transmitters are attached along the scute seams associated with the second vertebral and first costal scutes. Following carapace cleaning, the transmitter is positioned on the carapace to ensure flush contact with the carapace and then the perimeter of the transmitter attachment location is lightly traced with a Sharpie marker. Quick-setting Power's T-308 marine epoxy resin is then applied to the carapace within the confines of the marker tracing and built up approximately 0.5", after which the transmitter base is placed atop the epoxy and gently agitated while pushed downward to make contact with the carapace. The displaced epoxy is then built back up along the perimeter of the transmitter in a sloped fashion so that it is thickest closest to the transmitter but thin and flared approximately 2-3" around the entire transmitter; during this reforming process, additional T-308 epoxy may be added to ensure solid adherence to the carapace. Sea turtles are kept shaded and moist with wet towels while the T-308 epoxy is curing, and the temperature of the epoxy is monitored with a laser thermometer during the curing process as well; if the temperature exceed 110°F, cool water is added to the curing epoxy to reduce the temperature. Once the T-308 epoxy has cured completely, approximately 20 minutes after initial mixing, Sonic Weld putty epoxy is placed over the T-308 epoxy and satellite transmitter to create a smooth hydrodynamic surface (Mansfield et al. 2009).

The PI and the CI's are experienced with attaching satellite transmitters to loggerhead sea turtles; during 2004–2007 (Arendt et al. 2012a) and in 2010 (http://www.seaturtle.org/tracking/?project_id=510), satellite transmitters were attached to 66 juvenile loggerheads. Similarly, these researchers have attached 36 satellite transmitters to adult male loggerhead sea turtles between 2006–2007 (Arendt et al. 2012d,e) and 2013–2014 (http://www.seaturtle.org/tracking/index.shtml?project_id=828), with up to eight more satellite transmitter attachments to adult male loggerhead sea turtles slated for 2015.

The manufacturer for transmitters attached to sea turtles in the proposed research activities between 2016 and 2020 will almost certainly continue to be Telonics, Inc. given that this vendor consistently outbids competitors and their products have provided many data sets exceeding one year in duration. Transmitters for attachment to adult male loggerhead sea turtles will either be the TAM-4525-3 design used since 2013 or the replacement model for this design; these transmitters weigh 443 grams and coupled with the weight of attachment epoxy should weigh <2% of body mass (Winter 1996) for most sea turtles >60 cm SCLmin (~38 kg). However, in the interest of achieving a more desirable minimal drag (Jones et al. 2013), we will deploy the smallest possible satellite transmitters on juvenile loggerhead and Kemp's ridley sea turtles that are capable of providing a year of battery life. Furthermore, it is unlikely that Kemp's ridley sea turtles <40 cm SCLmin (~10 kg) will receive satellite transmitters. Transmitters will be coated with anti-fouling paint prior to their attachment as well as applied to cured epoxy to discourage biological fouling, further minimizing drag.

F. Blood sampling- Blood samples will be collected for all sea turtles >3kg body weight. Blood samples enable sea turtle demography (i.e., sex ratios and genetic haplotype distributions) as well as a suite of clinical health indicators to be measured. Blood will be collected in vacutainer tubes (with or without a heparin agent depending on collaborator need) using a vacutainer hub and a sterile 21-guage, 1.5" vacutainer needle. Blood will be collected from the dorsal cervical sinus as described by Owens and Ruiz (1980). Blood will be collected with sea turtles oriented head-down in a reclined position to facilitate blood flow to the cervical sinus. Prior to inserting the sterile vacutainer needle, the blood draw site will be cleaned with alcohol-soaked gauze. A maximum of four blood sticks (two per side of the neck) will be attempted per sea turtle.

Blood samples will consist of a maximum of 45 ml total volume and no more than 3ml per kg of body weight. These stipulations also conform to the total recommended volume (10% of total blood volume) based upon total weight as described by Jacobson (1998), who estimated that total blood volume in reptiles was 5 to 8% of total body weight. For example, assuming a blood volume of 5% body weight, a 50cm SCLmin turtle that weighs 15 kg (Mendonca and Ehrhart 1982, Maier et al., 2004) should have a total blood volume of 750 ml of which 75 ml is considered acceptable by Jacobson (1998). Therefore, the proposed maximum 45 ml sample is well below the recommended maximum for the smallest turtle we may encounter. A maximum amount of blood will be collected for an individual sea turtle as follows:

- Genetic stock identification - 2 ml (mitochondrial and nuclear DNA)
- Steroid hormones - 10 ml
- CBC/Blood chemistry -- 3 ml
- Stable isotopes – 10 ml
- Nutrition studies – 10 ml

• Contaminant studies - 10 ml

All loggerhead turtles collected since May 2000 have been of adequate size to collect all desired blood samples; however, it is often possible to split the collected blood volume to accommodate multiple researchers without collecting 45 ml of blood. This is an especially important practice for supporting health studies associated with smaller Kemp's ridley and green sea turtles. Repeat blood collection of recaptured sea turtles will only occur if more than 45 days has transpired since the last blood collection, and repeat blood sampling would be at 50% of the initially authorized volume (i.e., 1.5 ml per kg). Repeat capture of individuals is most likely to occur during surveys in spatially-focused sampling areas such as shipping channels and potentially enclosed estuarine waters.

G. Ultrasonography- Ultrasonography is used to evaluate gonadal development of juvenile loggerheads >75cm SCLmin as well as adult loggerheads (reproductively active vs. in-active in males, follicles vs. eggs in females). Although tail lengths >40% of straight-line carapace length are useful for identifying adult male loggerheads (Maier et al. 2004), not all large loggerheads with short tail lengths are females; thus, ultrasound enables the collection of additional data for determining the sex of pubescent loggerheads.

This procedure is a noninvasive technique commonly used in human medicine that allows the imaging of gonadal tissue and has been successfully used with loggerheads (Pease et al. 2010). Ultrasonography will occur at sea using a portable Sonosite 180Plus and imaging will occur with the turtle in supine position while resting on a foam-filled rubber tire. Imaging may also occur with turtles in an upright position while resting on a rubber tire, but such that a rear flipper is draped over the tire to provide a suitable space for the ultrasound probe to work in the inguinal region cranial to the hind leg. A coupling gel is used to insure transmission of the ultrasonic signal. Imaging data are electronically stored for future review, reducing this procedure time to approximately 10 min.

H. Laparoscopy – Laparoscopy provides more detailed imagery than ultrasound, particularly since true color is seen through the laparoscope and recorded using a BioVID camera. Because laparoscopy is an invasive procedure, it will only be performed by a highly trained individual under aseptic conditions, to include autoclave, gas, or chemical sterilization of all surgical equipment in between uses. For this permit application, we are only requesting permission for Dr. Terry Norton to be authorized to conduct laparoscopy on up to 20 Kemp's ridley sea turtles annually at the Georgia Sea Turtle Center (GSTC) in 2016 and 2017, for the purpose of assigning true sex based on the presence of ovaries or testes, for comparison with circulating testosterone levels measured through radioimmunoassay. These data will then be pooled with data collected by Joanne Braun-McNeill (NMFS SEFSC, Beaufort, NC) and Dr. Craig Harms (NC State University) to validate testosterone thresholds used for assigning sex for Kemp's ridley sea turtles. The testosterone assay has been validated for loggerhead sea turtles along the Atlantic Coast (Braun-McNeill et al. 2007), but only for Kemp's ridley sea turtles off the coast of Texas (Coyne 2000). The size range of Kemp's ridley sea turtles that would receive laparoscopic examination range from 20 to 65 cm SCLmin.

Kemp's ridley sea turtles receiving this procedure would either be captured in coastal waters off Brunswick, GA or in the estuarine waters of St. Simon's Sound, GA. To maximize efficiency for both field sampling and laparoscopic examination, all Kemp's ridley sea turtles captured on designated days would receive laparoscopic examination. Kemp's ridley sea turtles would be held in individualized containers containing foam padding and sufficient seawater to maintain moisture; a tarp will also be used to provide shade protection. Ideally all Kemp's ridley sea turtles selected to receive laparoscopy would be in the estuary to minimize on-boat holding prior to transferring Kemp's ridley sea turtles directly to the GSTC dock or the MAREX dock for transport to the GSTC via a temperature-controlled vehicle. Once a combined total of five Kemp's ridley sea turtles had been captured across all research sampling activities, or if any Kemp's ridley has been held in a container for three hours, sampling would cease in order to concentrate on transporting Kemp's ridleys to the GSTC. A target of five Kemp's ridley sea turtles per each of four sampling weeks is desired.

To initiate the surgical laparoscopy procedure, turtles will be anesthetized in dorsal recumbency with injectable anesthetics (dexmedetomidine, ketamine and butorphanol), intubated, and ventilated with oxygen. Sevoflurane will only be used if the turtle struggles. The animal will then be turned with the left side up and foam wedges and tape will be used to secure the animal in position. The inguinal incision site will then be prepped in a typical manner for surgery, including multiple scrubs of the surgical site alternating between Chlorhexadine surgical scrub and 70% alcohol. Betadine solution will also be applied to the site as a final surgical prep solution. The surgical site will be completely draped with sterile towels, typical of any human/animal surgical procedure. A local anesthetic (2% lidocaine) will be injected at the surgical site prior to making a small incision (~0.5 –1 cm) with a sterile scalpel blade, through which hemostats will be inserted to enter the body cavity, a trocar/cannula will then be placed with subsequent placement of the laparoscope through the cannula. Medical grade CO2 will be used to insufflate the

coelomic cavity if necessary for visualization of reproductive organs. Following laparoscopic evaluation, CO2 is removed from the body cavity with a syringe, extension set, 3 way stop cock and needle. Once the air is extracted, the canula is removed and the incision closed with absorbable suture (4.0 PDS). Upon completion of above procedures turtles will be transported to circular tanks approximately 8' in diameter and 4' deep. Seawater is introduced to the tanks via a flow-through design. Only one sea turtle will be placed in the holding tank at a time, with the primary post-surgical observation purpose being to ensure normal buoyancy and submergence capability.
Once normal buoyancy has been confirmed (generally within 20 minutes), turtles will be transported back to the general capture area via small boat and released over the side (boat out of gear). Turtles may be tagged with acoustic or satellite transmitters (methods previously described) to document normal behavior following laparoscopy. Should darkness, inclement weather or uncertainty regarding health status of turtle become a factor, the turtles will be held overnight at the GSTC and monitored throughout night as appropriate. Boat transport to coastal release areas will also occur on the day following capture because of the logistics associated with getting offshore to conduct sampling.

I. Keratin biopsy - Between 2006 and 2010 we collected blood and skin biopsy samples for stable isotope studies at the University of Florida under the direction of Karen Bjorndal. New research reveals that keratin biopsies provide more reliable information on foraging strategies due to the ability to examine temporal trends in isotope signatures (Vander Zanden et al. 2010); thus, we began collecting keratin biopsies in lieu of skin biopsies for loggerhead sea turtles beginning in 2011. In this permit application we are requesting permission to collect keratin biopsies for a subset of all hard-shelled sea turtle species captured, given the important information that these metric provides with regards to spatial foraging patterns (Wallace et al. 2006, Pajuelo et al. 2012). Furthermore, we are also requesting permission for an additional and published isotope researcher (Dr. Simona Ceriani, FWC) to receive keratin biopsies for conducting stable isotope analyses for loggerhead sea turtles captured in Canaveral, FL, for which she will be a proposal co-investigator.

Keratin biopsies will be collected in a manner consistent with activities previously permitted by Section 10(A(1)(a) Permit #15566. Samples will be collected from a distal and medial location on the third costal scute (left or right side) in an area devoid of abnormalities or epibionts but cleaned with an alcohol swab. A sterile 6mm biopsy punch will be pushed and twisted/rotated through the carapace approximately 6mm deep, at which point a small cracking noise will be heard indicating that biopsy punch has reached the bottom of the scute. Once the scute bottom has been reached, the biopsy punch will be gently rocked side-to-side to sever the sample, which will be removed from the biopsy punch using sterile foreceps and cryo-preserved for later analysis. The biopsy wound will be swabbed with betadine and SSD (Silver sulfadiazine) cream applied after sample extraction. SSD is a sulfa drug, is used ill a variety of bacteria and to prevent and treat infections of second- and third-degree burns (National Institutes of Health).

J. Cloacal swabs – Cloacal swabs will be opportunistically collected using previously permitted techniques to culture the bacteria that may be present. Sterile-packed swabs penetrate the cloaca roughly 5 cm, after which the swab is inserted into a media tube and cryo-preserved. The goal of this research is to document bacterial communities found in turtles as they relate to possible antibacterial release in marine systems. These samples complement the research overseen by Dr. Jan Gooch (NOAA) in 2005 and on-going antibiotic resistance studies with sea turtles conducted by collaborators at Clemson University (Dr. Charlie Rice).

K. Fecal samples – Fecal samples will be opportunistically collected without any manipulation to turtles, as the samples are removed from the deck after deposition. Samples will be collected by personnel wearing latex gloves, double-bagged in ziplock bags, and refrigerated separate from food items to minimize health risks to project personnel. Fecal samples contents, with emphasis on nematodes, will be analyzed by Dr. Ellis Greiner, DVM, at the University of Florida. The probability of collecting fecal samples on recaptured turtles is very low; however, multiple sampling with this non-invasive procedure is not harmful.

M. Growths and lesions – Unusual growths or lesions on soft or hard tissues will be photographed and a portion of the growth/lesion gently removed by appropriately trained personnel using a 6mm biopsy tool as appropriate. Samples will be stored in 95% ethanol and transferred to the UF College of Veterinary Medicine for identification. This procedure will only be performed opportunistically and in situations where collecting the biopsy sample can be done without causing injury to the animal; however, because there is no way to predict a priori which animals this procedure will need to be performed with, it is included as a standard sampling procedure. To date, only five biopsies have been collected for more than 2,700 sea turtles captured across our various Section 10 permits since 2000.

Supplemental Information

Status of Species: The loggerhead sea turtle is listed as "threatened" and the Kemp's ridley sea turtle is listed as "endangered" under the Endangered Species Act (ESA). Under the ESA, Atlantic green sea turtles are listed as "threatened" except for breeding population in Florida which are considered "endangered".

Seasonal occurrence of Atlantic and shortnose sturgeon in near shore coastal and estuarine waters near inlets in the spring suggests the greatest potential for interaction for sampling conducted in April and May (Post et al. 2014). No sturgeon were previously captured in the Port Canaveral, FL shipping channel in April 2006 or 2007; however, we did capture five Atlantic sturgeon (in 70 trawling events) in the Charleston, SC shipping channel in May 2005, all of which were promptly returned to the water. As such, we anticipate that no more than 10 Atlantic and 5 shortnose sturgeon will be incidentally captured across our various sampling efforts between 2016 and 2020.

Smalltooth sawfish occupy a range of habitats with respect to salinity and depth (as evidenced by our only capture eight miles off Cumberland Island in June 2015), but most often occur over sand or mud bottom near river and estuary mouths (http://www.savethesawfish.com/thecause.cfm). Since 1985 only one (now two) of 52 capture locations for this species in the United States occurred north of Florida (http://www.savethesawfish.com/thecause.cfm). As such, we anticipate that no more than two smalltooth sawfish will be incidentally captured across our various sampling efforts between 2016 and 2020.

Two marine mammal species co-occur in the waters proposed for sampling: bottlenose dolphins (Tursiops truncatus) and West Indian manatees (Trichechus manatus). Since beginning this research in 2000, we have had no interactions with manatees and only two dolphin entanglements, both of which were documented with the National Marine Fisheries Service.

Lethal Take: Since 2000, no turtles have died aboard our research vessels due to forced submergence, and only five sea turtles (of more than 1,600 captured with a 30-minute tow time) have required intubation and resuscitation at sea. Post-release, only 15 sea turtles have been reported stranded dead after release in our study three weeks to 12 years later (mean = 3 years), also suggesting minimal negative impacts. Despite increases in allowable annual take, annual mortality take, a subset of all turtles collected for each species, remain virtually unchanged or are more conservative than permitted for the previous three Section 10 permits. Because there is a very low inherent risk of incidental mortality during trawl surveys, we have included a minimal request for lethal take.

Anticipated Effects on Animals: The most negative impact of capturing sea turtles using nets of any type is forced submergence. Changes in blood metabolites associated with respiration are reported for sea turtles captured in our trawl survey (Harms et al. 2003); however, because seafloor tow time was restricted to 30-minutes we have not experienced any mortalities due to forced submergence as reported by Sasso and Epperly (2006) for much longer tow times. Only five of >2,600 sea turtles captured in our trawl surveys to date have required intubation, a further testament to the ability to safely conduct trawl surveys to capture sea turtles. We anticipate a similar safety record during trawl surveys to capture sea turtles during the next permitted sampling timeframe. Furthermore, because sea turtles can generally return to the surface to breathe when captured in tangle nets, and the near constant tending of tangle nets, we anticipate equal if not superior safe handling of sea turtles captured in this gear.

There exists a slight potential for injury (primarily in the form of net abrasion to the skin and flippers) during the capture and handling processes, as turtles that are caught in the net webbing (rather than the cod end) are removed from nets. This danger is mitigated by 'pinching' off sections of the net webbing with rope to prevent turtles from rolling in the net as it is safely brought aboard. Every effort is made to efficiently examine, measure, weigh, sample, tag, and photograph sea turtles so that they can be released at the point of capture within 30 minutes of removal from the net.

Tagging follows standard NMFS protocols with regards to aseptic cleaning of the skin with betadine and alcohol prior to tagging. Inconel tags and all other instruments that come into contact with turtles are also disinfected with nolvasan solution. Conventional tags (i.e., flipper tags, PIT tags) are intended for life-long attachment to permanently enable identification

of unique individuals; however, it is likely that only PIT tags will achieve this designation given that external flipper tags can become detached. Acoustic and satellite transmitters are attached with epoxy so that they only remain attached for the one-year battery life of the transmitter; to date we have only had one loggerhead recaptured after a year at large after it was released with a satellite transmitter (an adult male loggerhead), and the transmitter was gone with no trace of epoxy.

Infection risks associated with laparoscopy and biopsy procedures are minimized by utilizing experienced personnel and following proven protocols. Similarly, the risk of transmission of infectious diseases between sea turtles is minimized by disinfecting all working surfaces with bleach solution between animals, as well as changing gloves before handling animals as appropriate.

Large mesh webbing used in the trawl and tangle nets proposed for sampling, which minimizes the probability of capture for many non-target fish and invertebrate species. Among larger non-target species, negative effects associated with trawling have only been noted for small coastal sharks (measuring roughly 1.5 m TL) that can become entangled in the webbing. All reasonable efforts are made to free these sharks to include cutting the webbing to free them; however, when they are captured near the mouth of the net (approximately 3% of all shark catches) it is not always possible to reach them before asphyxia sets in. The shark species most negatively impacted by large trawl mesh is the blacknose shark (Carcharhinus acronotus), of which fewer than 50 are typically captured annually.

Similarly, as noted in the Status of Species section, there is a slight risk of capture of bottlenose dolphins, West Indian manatees, and smalltooth sawfish during trawling and tangle net operations; however, to date we have had no interactions with manatees, only one sawfish interaction (2015), and only two dolphin entanglements (2003, 2012) in more than 7,000 trawling events. Given that dolphins associate with trawlers in this region (Greenman and McFee 2015), our low interaction rate is a testament to the low probability of their capture in trawls.

With regards to the tangle net, we will avoid actively deploying gear in areas when air breathing dolphins or manatees are seen at the water surface. Should either species approach within 50 m of the deployed tangle net, both vessels will work together to initiate an emergency net haul-in.

In the event that a marine mammal or other large sea creature becomes entangled in a tangle net, considerable care must be taken to safely free it while ensuring the safety of researchers; large animals are capable of spinning in the net which poses risk of injury to both itself and crew operating in a small research vessel without a shipboard winch to relieve strain on the net. Therefore, the two research vessels will work collectively to reduce net strain while simultaneously positioning the animal to allow it to respire. Once net strain has been reduced and the animal is calm, the webbing will be cut and furled away so that the animal can be set free. All marine mammal and ESA-species interactions will be reported to federal and state coordinators as appropriate.

Measures to Minimize Effects: see above description for Anticipated effects on animals

Resources Needed to Accomplish Objectives: A wealth of demographic and health data are made available through collaborations with numerous researchers throughout the region, and a list of their sample needs during 2016-2020 is attached. Six co-investigators contribute greatly to data collection, analysis, and dissemination; an overview of their qualifications is attached below and their CV's are attached in the Contacts section of this permit application. Funding for all but study three will be provided by the Southeast Regional Office of the National Marine Fisheries Service; we are submitting a proposal to the Species Recovery Grants to States Program (FFO NOAA-NMFS-PRPO-2016-2004539) to support the research objectives for study three.

Disposition of Tissues: Blood (plasma, whole) and tissue (keratin biopsy, growths/lesions) will be distributed to collaborators at the conclusion of each season via personal delivery, pickup or overnight couriers as appropriate. Blood and tissue samples will be archived at the institutions of the recipients. Should an opportunity arise for additional use of these archived samples, we will coordinate with NMFS to add the new collaborators to our Section 10 permit as well as communicate with Section 6 coordinators in the shipping and receiving states to authorize the additional transport of biological samples. A list of collaborators requested to receive biological samples during 2016 to 2020 is included with this permit application.

Public Availability of Product/Publications: A comprehensive program website (http://www.dnr.sc.gov/marine/sturtles/) received >51,000 page visits between June 2012 and May 2015. Popular media such as newspapers, magazines, and local news stations have featured articles about this research program at least once annually on average. Numerous presentations have also been delivered to a variety of audiences ranging from elementary school students to international scientific symposia attendees. Annual and five year grant reports are posted online by the Southeast Fisheries Science Center in Miami, FL: http://www.sefsc.noaa.gov/turtledocs/contractreports.htm Nearly 30 peer-reviewed publications have been produced by project personnel and various collaborators since study onset (http://www.dnr.sc.gov/marine/sturtles/peerpubs.html).

Location/Take Information

Location

Study Number 1 **Research Area:** Atlantic Ocean **State:** SC **Stream Name:** Charleston, SC shipping entrance channel **Latitude North:** 32.75 **Latitude South:** 32.67 **Longitude East:** -79.67 **Longitude West:** -79.75 **Depth Range Lower Feet:** 35 **Depth Range Upper Feet:** 60
Location Description: Repeat trawling at stations sampled by Arendt et al. (2012c) in 2004-2007, and in early 1990's by Van Dolah and Maier (1993) and Dickerson et al. (1995)

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	70	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	7/15/2017
		Details: standard processing												
2		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	40	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	6/16/2016	7/15/2017
		Details: standard plus acoustic tags and tissue samples												

3		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	5	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	6/16/2016	7/15/2017
		Details: standard plus acoustic tags and tissue sampling												
4		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	3	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	6/16/2016	7/15/2017
		Details: standard plus acoustic tags and tissue sampling												
5		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	7/15/2017
		Details: reduced standard processing												

Location

Study Number 2 **Research Area:** Atlantic Ocean **State:** GA **Stream Name:** Atlantic Ocean and St. Simon's Sound **Latitude North:** 31.25 **Latitude South:** 31.00 **Longitude East:** -81.25 **Longitude West:** -81.60 **Depth Range Lower Feet:** 5 **Depth Range Upper Feet:** 60

Location Description: Conduct trawling in coastal waters near Brunswick, GA and trawling and tangle net sampling in adjacent estuary to outfit Kemp's ridley sea turtles with telemetry devices to study spatial occurrence relative to trawl survey boundaries.

Take Information

			Listing	Production			Expected	Takes Per		Observe /Collect		Transport	Begin	

Line	Ver	Species	Unit/Stock	/Origin	Life Stage	Sex	Take	Animal	Take Action	Method	Procedure	Record	Date	End Date
1		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	44	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	8/31/2017
		Details: standard processing, trawl capture												
2		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	20	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Laparoscopy ; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Sample, scute scraping; Transport; Ultrasound; Weigh	3	6/16/2016	8/31/2017
		Details: standard plus telemetry, tissue biopsy, laparoscopy												
3		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	4	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	8/31/2017
		Details: standard processing, tangle net capture												
4		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	20	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Laparoscopy ; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Sample, scute scraping; Transport; Ultrasound; Weigh	3	6/16/2016	8/31/2017
		Details: standard (tangle net) plus telemetry, tissue biopsy, laparoscopy												

5		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	48	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	8/31/2017
		Details: standard processing, trawl capture												
6		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	12	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	8/31/2017
		Details: standard processing, tangle net capture												
7		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	16	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	6/16/2016	7/31/2017
		Details: standard plus keratin and cloacal, trawl capture												
8		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	24	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	6/16/2016	7/31/2017
		Details: standard plus keratin and cloacal, tangle net capture												
9		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ;	N/A	6/16/2016	7/31/2017

											Ultrasound; Weigh			
		Details: standard processing, trawl capture												
10		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	6/16/2016	7/31/2017
		Details: standard processing, tangle net capture												

Location

Study Number 3 **Research Area:** Atlantic Ocean **State:** FL **Stream Name:** Port Canaveral, FL shipping entrance channel **Latitude North:** 28.417 **Latitude South:** 28.367 **Longitude East:** -81.517 **Longitude West:** -81.583 **Depth Range Lower Feet:** 15 **Depth Range Upper Feet:** 60
Location Description: Trawling in the dredged shipping channel; most productive stations in 2006-07 (Arendt et al. 2012d) were between buoy pairs 3/4 and 7/8, similar to trends reported by Henwood (1987)

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	5	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard processing												
2		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	15	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard plus keratin and cloacal												

3		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard processing												
4		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult	Female	35	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard processing												
5		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Juvenile/ Subadult	Male and Female	455	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard processing												
6		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult	Male	85	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	2/1/2017	5/31/2019
		Details: standard plus keratin and cloacal												
7		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult	Male	40	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab;	N/A	2/1/2017	5/31/2019

											Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh			
	Details: standard plus keratin, cloacal, and telemetry													

Location

Study Number 4 **Research Area:** Atlantic Ocean **State:** NA **Stream Name:** Atlantic Ocean from Winyah Bay, SC to St. Augustine, FL **Latitude North:** 33.1 **Latitude South:** 29.9
Longitude East: -79.00 **Longitude West:** -81.26 **Depth Range Lower Feet:** 15 **Depth Range Upper Feet:** 60
Location Description: Coastal waters historically sampled by this trawl survey since May 2000 (Arendt et al. 2012b,f)

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	135	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	5/1/2018	6/15/2021
		Details: standard processing												
2		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Juvenile/ Subadult	Male and Female	20	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	5/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
3		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult	Male	5	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample,	N/A	5/1/2018	6/15/2021

											blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh			
		Details: standard plus cloacal, keratin, and telemetry												
4		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	35	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	5/1/2018	6/15/2021
		Details: standard processing												
5		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	10	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	5/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
6		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	3	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	5/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
7		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample,	N/A	5/1/2018	6/15/2021

											blood ; Sample, fecal ; Ultrasound; Weigh			
	Details: standard processing													

Location

Study Number 5 **Research Area:** Atlantic Ocean **State:** SC **Stream Name:** South Carolina State Waters **Latitude North:** 32.85 **Latitude South:** 32.03 **Longitude East:** -78.55
Longitude West: -80.90 **Depth Range Lower Feet:** 5 **Depth Range Upper Feet:** 40
Location Description: Tangle netting in South Carolina state waters associated with five major estuaries in the state.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	18	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard processing												
2		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	10	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
3		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	46	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021

		Details: standard processing												
4		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	10	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
5		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	46	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard processing												
6		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	10	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard plus cloacal, keratin, and telemetry												
7		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Capture/Handle/Release	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood ; Sample, fecal ; Ultrasound; Weigh	N/A	4/1/2018	6/15/2021
		Details: standard processing												

Location

Study Number 6 **Research Area:** Atlantic Ocean **State:** NA **Stream Name:** state and federal waters in FL, GA, and SC **Latitude North:** 33.1 **Latitude South:** 28.3 **Longitude East:** -79.0 **Longitude West:** -80.6
Location Description: Incidental mortality across studies 1 through 5 during the life of the requested permit.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	3	1	Unintentional mortality	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit												
2		Turtle, loggerhead sea	Northwest Atlantic Ocean DPS (NMFS Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	2	1	Unintentional mortality	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit												
3		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit												
4		Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit												

5		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit											
6		Turtle, green sea	Range-wide (NMFS Endangered/Threatened)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit											
7		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, trawl	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit											
8		Turtle, leatherback sea	Range-wide (NMFS Endangered)	Wild	Adult/ Subadult/ Juvenile	Male and Female	1	1	Unintentional mortality	Net, Tangle	Collect, tumors; Epibiota removal; Mark, carapace (temporary); Measure; Photograph/Video; Sample, blood ; Sample, cloacal swab; Sample, fecal ; Sample, scute scraping; Ultrasound; Unintentional mortality; Weigh	N/A	6/16/2016	6/15/2021
		Details: over the course of the permit											

Transport Information

3.

Mode(s) of Transportation: Transportation of Kemp's ridley sea turtles to the GA Sea Turtle Center (GSTC) for laparoscopic examination will occur via small research vessel (i.e., those used to deploy tangle nets) or via an air-conditioned vehicle.

Transportation Company: Personnel transporting sea turtles to a rehabilitation facility will be employees of the South Carolina DNR, University of Georgia Marine Extension Service, Georgia DNR, or their designees.

Maximum amount of time between capture and arrival: Holding time between capture and arrival at the GSTC will be less than two hours if Kemp's ridley sea turtles are captured in the estuary; however, if captured in coastal waters holding time may be up to four hours.

Container Description:	Sea turtles sea turtles captured by trawls will be held in small tanks filled with seawater that will be located under a tarp that shades nearly the entire back deck of the boat. Sea turtles captured by tangle netting will be held in small tanks filled w
Special Care:	Wet towels will be used to keep sea turtle skin and shell moist.
Accompanying Personnel Qualifications:	Sea turtles will not be accompanied by a veterinarian, but will be transported by personnel trained in proper sea turtle care to a veterinarian who will perform the laparoscopy procedures.
Facility Title:	GA Sea Turtle Center
Facility Affiliation/Organization:	GA Sea Turtle Center
Address:	214 Stable Road Jekyll Island, GA 31527 UNITED STATES
Phone Number:	(912)635-4070 ext.
Containment Method:	At the rehabilitation facility, sea turtles will primarily be housed in filtered seawater tanks before and after laparoscopic examination.
Final Disposition:	Sea turtles will be released by boat following medical clearance for release (i.e., normal buoyancy is restored and sea turtles are alert). We anticipate that sea turtles will be released the following day, but may be released the same day.

NEPA Checklist

1) If your activities will involve equipment (e.g., scientific instruments) or techniques that are new, untested,or otherwise have unknown or uncertain impacts on the biological or physical environment , please discuss the degree to which they are likely to be adopted by others for similar activities or applied more broadly.

All scientific instruments used to collect data and/or samples and all data recording devices attached to sea turtles are proven technologies. The use of trawling to capture sea turtles on coastal foraging grounds has also gained recognition within the scientific and management communities, as evidenced by heavy citation of publications associated with this research program in the Critical Habitat Plan for NW Atlantic Loggerhead Sea Turtles; we anticipate similar representation in a future revision to the Recovery Plan for this DPS as well. Similarly, during the previous permit application period we were asked about the feasibility of relocating this trawl survey to NC and/or SW Florida. For various reasons the trawl survey was not relocated; however, the PI is aware of interest among several researchers based in Florida and Louisiana and potential funding through the National Fish and Wildlife Federation to develop a companion trawl survey in the northern Gulf of Mexico.

2) If your activities involve collecting, handling, or transporting potentially infectious agents or pathogens (e.g., biological specimens such as live animals or blood), or using or transporting hazardous substances (e.g., toxic chemicals), provide a description of the protocols you will use to ensure public health and human safety are not adversely affected, such as by spread of zoonotic diseases or contamination of food or water supplies.

Latex gloves are worn by researchers handling turtles to provide a barrier between the turtles and the researchers. Researchers are encouraged to remove jewelry as well as to wash hands and other body parts after turtles have been worked up and released. To reduce the probability of turtle-to-turtle contamination, turtles are separated from each other on the deck and working surfaces are scrubbed with a chlorox solution in between processing turtles.

Dangerous working conditions are encountered during this research, as nearly all activities are conducted aboard a moving research vessel. The captain conducts a thorough safety

briefing with all new field personnel. Sharp's containers are located on the back deck and in the blood processing laboratory for immediate disposal of needles, syringes, and other pertinent medical supplies. Equipment used in conjunction with collecting blood samples are secured to prevent movement.

Samples from or intact by-catch specimens are generally preserved by freezing and are transported (personal delivery) to or picked up by collaborators using ice packs or dry ice.

3) Describe the physical characteristics of your project location, including whether you will be working in or near unique geographic areas such as state or National Marine Sanctuaries, Marine Protected Areas, Parks or Wilderness Areas, Wildlife Refuges, Wild and Scenic Rivers, designated Critical Habitat for endangered or threatened species, Essential Fish Habitat, etc. Discuss how your activities could impact the physical environment, such as by direct alteration of substrate during use of bottom trawls, setting nets, anchoring vessels or buoys, erecting blinds or other structures, or ingress and egress of researchers, and measures you will take to minimize these impacts.

Trawling is not conducted near any officially designated marine protected areas, with the exception of seasonally closed areas for northern right whales. We are unaware of any rare habitats that have been proposed for protection within our trawling areas. Live bottom habitats occur sporadically on the continental shelf throughout the southeastern United States (Cummins et al. 1962) and are associated with ~25% of annual trawling events (Arendt et al. 2012f), mostly due to the capture of long and short-spine urchins (http://www.dnr.sc.gov/marine/sturtles/bycatchproc.html). A series of 21 mud rollers are deployed along the trawl foot-rope to facilitate the net 'rolling' over topographical features that might otherwise be snagged during trawling.

In estuarine sampling zones, live bottom habitats are predominantly restricted to the marsh edge where inter-tidal oyster reefs provide sufficient hard substrate for colonizing animals; trawling will not be conducted in these habitats, and tangle net deployment sites will be evaluated at low water before setting out gear at high water to minimize the potential for habitat disruption from this static gear.

4) Briefly describe important scientific, cultural, or historic resources (e.g., archeological resources, animals used for subsistence, sites listed in or eligible for listing in the National Register of Historic Places) in your project area and discuss measures you will take to ensure your work does not cause loss or destruction of such resources. If your activity will target marine mammals in Alaska or Washington, discuss measures you will take to ensure your project does not adversely affect the availability (e.g., distribution, abundance) or suitability (e.g., food safety) of these animals for subsistence uses.

Trawling and tangle net sampling will not occur within 0.25 nm of submerged scientific, cultural, or historic resources that are marked on nautical charts. Because of the maritime trade and naval history of this part of the country it is possible that unmarked structures of archaeological value occur in the sampling area; however, only two sunken vessel anchors have been encountered during the past 15 years (>6,800 total trawling events) of sampling. Tribal subsistence fisheries do not exist in the proposed study area; potential impacts to five ESA-listed species (Atlantic and shortnose sturgeon, smalltooth sawfish, bottlenose dolphins, West Indian manatees) are addressed in the Supplemental Information/Impacts to other species section of this permit application.

5) Discuss whether your project involves activities known or suspected of introducing or spreading invasive species, intentionally or not, (e.g., transporting animals or tissues, discharging ballast water, use of equipment at multiple sites). Describe measures you would take to prevent the possible introduction or spread of non-indigenous or invasive species, including plants, animals, microbes, or other biological agents.

We are unaware of implications of our research activities introducing and/or spreading invasive species, intentionally or otherwise. All blood and tissue samples are collected using latex gloves intended to minimize the chance of human-pathogen contact. Blood and tissue samples are stored in plastic vials with threaded tops to prevent content leakage and then stored at temperatures ranging from 78°F to -80°C depending on collaborator sample storage protocols. Our research trawlers that are used for this research do not take on or discharge ballast water. Although we deploy the same gear across multiple areas, the large mesh webbing associated with our trawl gear (as well as the proposed tangle nets) minimizes the total number of organisms captured; in turn, with the exception of sea stars and jellyfish that can wrap their bodies around the webbing, large mesh webbing is also conducive to shaking organisms caught in the wing of the net (and thus not able to be brought onboard) concurrent with processing the trawl catch. As such, there is little opportunity to transport organisms from one location to another distant location.

Project Contacts

Primary Contact: Mike Arendt

Principal Investigator: Mike Arendt

Other Personnel:

Name	Role(s)
Julia Byrd	Co-Investigator
Lindsey Parker	Co-Investigator
Susan Michelle Pate	Co-Investigator
Jeff Schwenter	Co-Investigator
Al Segars	Co-Investigator
J. David Whitaker	Co-Investigator

Attachments

Contact - Al Segars C8802T5Segars CV.docx (Added May 26, 2015)

Contact - J. David Whitaker C6741T5Whitaker_CV 2014.doc (Added May 21, 2015)

Contact - Jeff Schwenter C14106T5Schwenter_CV 2014.doc (Added May 21, 2015)

Contact - Julia Byrd C18699T5Byrd_Resume.doc (Added May 21, 2015)

Contact - Lindsey Parker C18701T5Parker_CV.docx (Added May 26, 2015)

Contact - Mike Arendt C8803T5Arendt_CV.doc (Added May 17, 2015)

Contact - Susan Michelle Pate C18700T5S.MichellePate_CV_2015.pdf (Added May 23, 2015)

Location - L42255T3Study 1_Charleston Channel.pdf (Added May 16, 2015)

Location - L42256T3Study 2_St. Simon's Sound.pdf (Added May 23, 2015)

Location - L42257T3Study 3_Port Canaveral Channel.pdf (Added May 16, 2015)

Location - L42281T3Study 4_Regional Survey.pdf (Added May 16, 2015)

Location - L42282T3Study 5_South Carolina Estuaries.pdf (Added May 16, 2015)

References - P19621T12Permit19621_References.docx (Added Sep 10, 2015)

Resources Needed - P19621T15Permit19621_SampleTable.xlsx (Added May 23, 2015)

Resources Needed - P19621T15PIandCIQualifications.docx (Added Sep 10, 2015)

Resources Needed - P19621T15TangleNetTrainingCertification.pdf (Added Sep 10, 2015)

Status

Application Status: Application Complete
Date Submitted: May 26, 2015
Date Completed: September 17, 2015
FR Notice of Receipt Published: October 5, 2015 **Number:** 2015-25215
Comment Period Closed: November 4, 2015 **Comments Received:** Yes **Comments Addressed:** Yes
Last Date Archived: June 30, 2016

- **ESA Section 10(a)(1)(A) permit (other)**
  Current Status: Issued **Status Date:** June 16, 2016
  Section 7 Consultation: Formal Consultation
  NEPA Analysis: Categorical Exclusion
  Date Cleared by General Counsel: June 9, 2016
  Expire Date: June 15, 2021

Analyst Information:

1)	Amy Hapeman	Phone: (301)427-8401 Email: Amy.Hapeman@noaa.gov
2)	Malcolm Mohead	Phone: (301)427-8427 Fax: (301)713-0376 Email: Malcolm.Mohead@noaa.gov

Modification Requests

Reports